

**Version of Amended Claim 1 with markings to show changes made**

- 1) Apparatus for the conversion of energy[, comprising:
  - a) a source of energy; [for promoting electron tunneling, and,]
  - b) an emitter electrode[, connected to said source of energy<sub>1</sub>[, and,]
  - c) a collector electrode, [positioned sufficiently close to said emitter electrode for electrons to tunnel from the emitter electrode to the collector electrode<sub>2</sub>[, and,]
  - d) an electrical circuit [means,] connecting[ed to] said electrodes<sub>1</sub>[, for the circulation of electrons,] and[,]
  - e) manipulating means for controlling the distance separating said [relative] electrodes [positioning], connected to either [one] or both of said electrodes<sub>2</sub>

wherein said distance separating said emitter electrode and said collector electrode is sufficiently small for electrons to tunnel from said emitter electrode to said collector electrode.

**Version of Amended Claim 4 with markings to show changes made**

- 4) The apparatus of claim 2 wherein said housing is[means further comprises] flexible to allow  
[housing means for the enablement of] the movement of said manipulating means and of said  
electrodes.

**Version of Amended Claim 5 with markings to show changes made**

- 5) The apparatus of claim 37 further comprising thermally conductive metal powder,  
wherein[connected to] said [collector] electrodes [for the transferal of thermal energy].

**Version of Amended Claim 7 with markings to show changes made**

- 7) The apparatus of claim 1 further comprising measuring[control] means to enable the measurement of the distance separating[for assessing] the electrodes distance[, and for actuating said manipulating means based on such assessment].

**Version of Amended Claim 8 with markings to show changes made**

- 8) The apparatus of claim 1 wherein said manipulating means is selected from the group [comprising] consisting of: piezo-electric, electrostrictive, and magnetostrictive actuators.

**Version of Amended Claim 9 with markings to show changes made**

- 9) The apparatus of claim [8]1 wherein said manipulating means comprises multiple actuators.

**Version of Amended Claim 10 with markings to show changes made**

- 10) The apparatus of claim 9 comprising means for controlling said multiple actuators independently.

**Version of Amended Claim 13 with markings to show changes made**

- 13) The apparatus of claim 1, wherein the conversion of energy is [for] the conversion of thermal energy to electrical energy, wherein said source of energy comprises[is] a source of thermal energy[, and said emitter electrode is thermally connected to a source of thermal energy], and wherein said apparatus further comprises:
- a) a first thermal interface thermally connecting said source of energy to said emitter electrode;
  - b) a second thermal interface thermally connecting a heat sink means[, thermally connected] to said collector electrode<sub>2</sub>[, and]
  - c) an electrical load, electrically connected by said circuit between [to] said collector electrode and said emitter electrode.



**Version of Amended Claim 14 with markings to show changes made**

- 14) The apparatus of claim 13 wherein said source of thermal energy is of solar origin[, wherein solar heat is directed towards said emitter electrode].

**Version of Amended Claim 15 with markings to show changes made**

- 15) The apparatus of claim 1, wherein the conversion of energy is the conversion of light energy to electrical energy [for photoelectrical electricity generation], wherein said source of energy comprises[is] a source of photons, directed at said emitter electrode for impacting the electrons in said emitter electrode and for causing said electrons to tunnel to said collector electrode, and wherein said apparatus further comprises an electrical load, electrically connected by said circuit between [to] said collector electrode and said emitter electrode], for receiving generated electricity].

**Version of Amended Claim 16 with markings to show changes made**

- 16) The apparatus of claim 15 wherein said conversion of energy additionally comprises the conversion of heat energy to electrical energy and wherein said source of photons is also a source of thermal energy[ for providing said electrons in said emitter electrode with additional ability to tunnel to said collector electrode].

**Version of Amended Claim 17 with markings to show changes made**

17) The a[A]pparatus of claim 1, wherein the conversion of energy is [for] the conversion of electrical energy to heat pumping capacity[, comprising the apparatus of claim 1], wherein said source of energy comprises an electrical power supply, and wherein said apparatus further [apparatus] comprises:

- a) [ing]a heat source and a heat sink, wherein said heat source may be cooler than said heat sink, and wherein said heat source is thermally connected to said emitter electrode and said heat sink is thermally connected to said collector electrode, and,
- b) means for applying a voltage bias to said electrodes for causing said emitter electrode to emit [more] electrons [via]originating from above the Fermi level via quantum mechanical [thermo]tunnelling[ than the collector electrode emits], whereby heat pumping is enabled.

**Version of Amended Claim 23 with markings to show changes made**

- 23) A first and a second electrode for use in a diode device, each electrode having a surface for positioning facing the other electrode, wherein said surfaces are substantially flat and wherein surface features of one electrode match surface features of the other electrode[ comprise matching topographical features to one another].

**Version of Amended Claim 26 with markings to show changes made**

- 26) The diode device of claim 24 wherein the electrodes are positioned 100 angstroms apart or closer[, and wherein an inert gas fills the region between them].

**Version of Amended Claim 27 with markings to show changes made**

- 27) The diode device of claim 24 further comprising manipulating means for controlling the spacing between said electrodes[, wherein said manipulating means is selected from the group consisting of: electroactive, magnetostrictive, electrostrictive, and piezo-electric means].

**Version of Amended Claim 31 with markings to show changes made**

- 31) The two electrodes of claim 29 wherein said electrode for higher temperature operation comprises[is composed of] titanium.



**Version of Amended Claim 32 with markings to show changes made**

- 32) The two electrodes of claim 29 wherein said other electrode comprises[is composed of] aluminum.

**Version of Amended Claim 33 with markings to show changes made**

33) A method for making the pair of electrodes of claim 23[, said method] comprising the steps of:

- a) [fabricating] providing a first electrode with a substantially flat surface fabricated from a first material;[,]
- b) coating said surface of said first electrode with a thin[, uniform] layer of a second[first] material;[,]
- c) coating said layer of said second[first] material with a layer of a third[second] material, said third material forming[suitable for use as] a second electrode[,;][and,]
- d) separating said first electrode and said third[first and second] material[s] from one another, in a manner non-destructive to said first electrode and said third[second] material[, whereby said third material is suitable for use as a second electrode], wherein surface features of said second electrode match surface features of [and comprises matching topographical features to] said first electrode;
- e) removing said second material.

**Version of Amended Claim 35 with markings to show changes made**

- 35) The method of claim 33 in which said second[first] material is removed by a process comprising[selected from the group consisting of:] heating to a temperature greater than that of the melting temperature of said second[first] material but lower than the melting temperature of said first electrode and of said third[second] material, so as to evaporate said second[first] material[, introducing a solvent to dissolve said first material, introducing a reactive solution which reacts with said first material and dissolves it, and applying a vacuum to pump out any materials except said first electrode and said second material, or a combination of the above processes].

**Version of Amended Claim 36 with markings to show changes made**

36) The method of claim 33 additionally comprising the steps of:

- a) attaching said first electrode and said third[second] material to controllable positioning means[,];
- b) [and]separating said first material from said third material in step (d) of claim 33 using said controllable positioning means, [to effect a separation between said first electrode and said second material in the separating step[
- c) ] so that surface[topographical] features on the surface of said first electrode are maintained in spatial orientation with said matching surface[topographical] features on said second electrode.